The Analysis of Verbal Behavior 2012, **28,** 119–124

Training and Generalization of Peer-Directed Mands With Non-vocal Children With Autism

Tiffany Kodak, University of Oregon
Amber Paden and Nitasha Dickes
University of Nebraska Medical Center's Munroe-Meyer Institute

The current investigation evaluated the effects of extinction and prompts on training and generalization of peer-directed mands for preferred items using a picture exchange communication system with 2 children diagnosed with autism. Results showed that independent mands with a peer increased during treatment for both participants, generalized to a novel peer without explicit training for 1 participant and following training for the second participant, and maintained in a more naturalistic setting that simulated a free-play activity in a classroom.

Key words: autism, extinction, mand, picture exchange communication system

The development of a mand repertoire is an important component of early language training for individuals diagnosed with autism spectrum disorders (ASD). The majority of research evaluating mand training with individuals with ASD has focused on teaching vocal mands for preferred items, despite the frequency with which these individuals use alternative modes of communication (Sundberg & Sundberg, 1990). One relatively common alternative mode of communication used by children with ASD involves a picture exchange communication system (PECS; Bondy & Frost, 2001). However, evaluations of mand training with PECS frequently include an adult as the recipient of the PECS exchange who delivers access to preferred items (e.g., Chaabane, Alber-Morgan, & DeBar, 2009).

Mand training with peers is also an important component of intervention for individuals with ASDs. Mand training between developmentally delayed peers may provide opportunities for additional interactions that could assist in establishing friendships. In addition, in situations in which a peer is playing with a child's highly preferred items, it is important to teach the child to engage in peer-directed mands instead of engaging in other, potentially less socially acceptable, ways of obtaining the item (e.g., grabbing the item out of a peers hands). Also, pairing peer interactions with access to highly preferred items may increase the reinforcing value of these interactions, thereby conditioning peer interactions as reinforcers. Peer-directed mands, and any subsequent social interactions occasioned by mands, may rarely occur in the absence of training (Taylor et al., 2005).

An ideal outcome of peer-directed mand training is for a child to approach a peer who is currently consuming a preferred item and mand for access to that item in the absence of adult prompts. However, previous studies on peer-directed mand training have not measured whether newly acquired mands extend beyond the treatment context (Paden, Kodak, Fisher, Gawley-Bullington, & Bouxsein, in press; Taylor et al., 2005). For example, Paden and colleagues (in press) evaluated differential reinforcement of alternative behavior (DRA) plus prompting to increase peer-directed mands using PECS with two boys diagnosed with autism. The results indicated that both boys engaged in high rates of peer-directed mands during treatment, and a portion of the peer-directed mands resulted in subsequent social interaction. Although the results suggest that DRA plus prompting may be one effective mand-training strategy for children with ASDs, the authors did not evaluate the generalization of peer-directed mands to novel peers or more

We thank Lindsey Lousch, Carissa Nohr, and Dana Gadaire for their assistance with aspects of data collection. Please address correspondence to Tiffany Kodak, Ph.D., Department of Special Education and Clinical Sciences, 5208 University of Oregon, Eugene, OR 97403-5208. (e-mail: tkodak@uoregon.edu).

naturalistic settings. Both participants engaged in peer-directed mands within 1 m of each other while sitting at a table. The present investigation sought to replicate the findings of Paden and colleagues by evaluating the effects of extinction plus prompting on peer-directed mands. We also extended Paden et al. by evaluating the extension of treatment effects to a novel peer and a more natural setting.

METHOD

Participants, Setting, and Materials

Two non-vocal children diagnosed with autism participated in the investigation. Oliver was 5 years old, and Simon was 9 years old. Both participants attended a university-based early intervention program and engaged in mands with adults using PECS. Participants completed PECS training (Phases 1–3; Bondy & Frost, 2001) prior to the initiation of the investigation and served as peers for each other during the evaluation. In the treatment extension phase of the study, an additional child (Nigel) served as a peer. Nigel was a 6-year-old boy diagnosed with autism who readily responded to PECS initiations from peers without adult assistance and delivered appropriate consequences following peer mands.

We conducted all sessions in a classroom that contained play materials typical of a classroom environment (e.g., books, toys, art materials) and relevant session materials (e.g., data sheets, PECS binders). We conducted the treatment evaluation at a table that contained leisure items (e.g., movie), edibles (e.g., potato chip, fruit candy), and a PECS binder for each participant. The PECS binder included at least 15 PECS cards depicting preferred leisure items and edibles and 3 distracter PECS cards that displayed nonpreferred items. All preferred and nonpreferred items were identified as such based on prior and daily preference assessments (Fisher et al., 1992; Higbee, Carr, & Harrison, 2000) and data indicating frequently and infrequently exchanged PECS cards. All items were in the possession of the peer during sessions. We conducted treatment extension sessions in a different portion of the classroom. Participants did not sit at a table and they walked 3.5 m to 7 m to engage in a peer-directed mand with each other or a novel peer.

Dependent Variables and Interobserver Agreement

Observers scored all dependent variables for each participant. The dependent variables included (a) independent mands with a peer, defined as selecting and placing a PECS card in the hand of a child, and (b) prompted mands, defined as PECS exchanges with a peer that required prompting from an adult at any point in the exchange.

Observers scored the number of independent and prompted mands per session. We converted mands to a rate measure by dividing the frequency of mands by 5 min. Two independent observers collected data on all dependent variables during 75.8% of Oliver's and 69.2% of Simon's sessions. We calculated interobserver agreement for sessions on a trial-by-trial basis by dividing the number of 30-s trials with agreements by the total number of 30-s trials in a session and multiplying by 100. Mean agreement for independent and prompted mands was 98.1% (range, 80% to 100%) for Oliver and 97.3% (range, 80% to 100%) for Simon.

General Procedure

The mand-training procedures were similar to those described by Paden and colleagues (in press). All sessions were 5 min in duration and included 10 30-s trials. The participant and peer sat within 1 m of each other at a table during the treatment evaluation (i.e., the first four phases). Each participant had a PECS binder that contained at least 15 previously trained PECS cards displaying highly preferred leisure or edible items and 3 distracter PECS cards. The peer had items associated with PECS cards in front of or next to him on or next to the table and in view of the participant, and the peer consumed or interacted with some of the items during the trial. During each 30-s trial, the therapist placed the PECS binder in front of the participant. The therapist did not prompt the participant to select a picture from the PECS binder at any point in the session. Thus, the participant was not required to select a PECS card at any point during the investigation (only two trials during treatment were associated with a failure to select a PECS card). Following independent or prompted peer-

directed mands, the peer delivered the item associated with the PECS card for 10 s. An adult provided assistance to the peer to accept the PECS card and provide the appropriate item, if necessary. Peer-directed mands for a distracter item would have resulted in the delivery of the associated item for 10 s, although neither participant ever selected the distracter PECS cards. Following the 10-s consumption interval, the preferred item was returned to the peer, and the therapist represented the PECS binder to provide an opportunity for additional mands until the 30-s trial ended. Therefore, participants could engage in up to three peer-directed mands per trial. Each participant served as a speaker (i.e., engaged in mands) during one session and a listener (e.g., responded to peer-directed mands) during another session in the same day.

During treatment extension sessions, the participant and peer were located either 3.5 m or 7 m apart. The participant was at a distance of 3.5 m from the peer during the first two phases of treatment extension sessions, and the other participant or a novel peer sat at or stood near a table containing the preferred items. During the final phase of the treatment extension, the participant was 7 m away from a novel peer who played with toys included in the PECS book while facing away from the participant (to simulate typical classroom conditions in which peer-directed mands may be most likely to occur). Thus, the participant had to travel a greater distance to engage in a peer-directed mand with a novel peer who was playing with toys (i.e., items for which the participant could mand) and not attending to the participant. In all treatment extension sessions, the therapist remained a distance of at least 3.5 m or 7 m from the peer.

Treatment Evaluation

Baseline. The therapist did not provide any prompts or assistance to the participant to engage in peer-directed mands. However, the therapist delivered an item associated with the PECS card following a mand directed toward an adult (data available upon request). Adult-directed mands were honored to prevent extinction of previously acquired mands with PECS.

Prompts plus extinction (P + EXT). The same therapist conducted sessions during baseline and treatment. The procedures were similar to baseline with a few exceptions. During treatment, mands with an adult were placed on extinction. That is, the therapist did not respond to an adult-directed mand for 5 s. Following the participant's independent selection of a PECS card, and 5 s after an attempt to mand with an adult or without a peer-directed mand, the therapist provided the least amount of guidance necessary to assist the participant in completing a peer-directed mand. Thus, the therapist provided partial or full physical guidance, but she did not provide any vocal prompts. The therapist also provided the least amount of guidance necessary to assist the peer in accepting the PECS card and delivering the appropriate consequence if the peer did not engage in these behaviors independently.

Treatment Extension

Baseline with extinction (Baseline/EXT). The procedures were similar to baseline sessions in the treatment evaluation with several exceptions. The participant was either (a) 3.5 m away from the other participant, (b) 3.5 m away from a novel peer, or (c) 7 m away from a novel peer (Nigel) who played with toys with his back toward the participant during the sessions. In addition, Nigel was not seated at a table during the session. Thus, the participant was required to travel a distance to engage in a peer-directed mand without any adult assistance. The therapist maintained a distance of at least 3.5 or 7 m from the peer during these phases. Adult-directed mands were placed on extinction.

Training (Oliver only). The procedures were identical to those described in the prompts plus extinction condition of the treatment evaluation except that Oliver had to travel 3.5 m to engage in a peer-directed mand with a novel peer (Nigel). No therapist assistance was necessary for Nigel to accept the PECS card and deliver the appropriate consequence.

RESULTS AND DISCUSSION

The results of the treatment and generalization evaluation are displayed in Figure 1. The participants did not engage in peer-

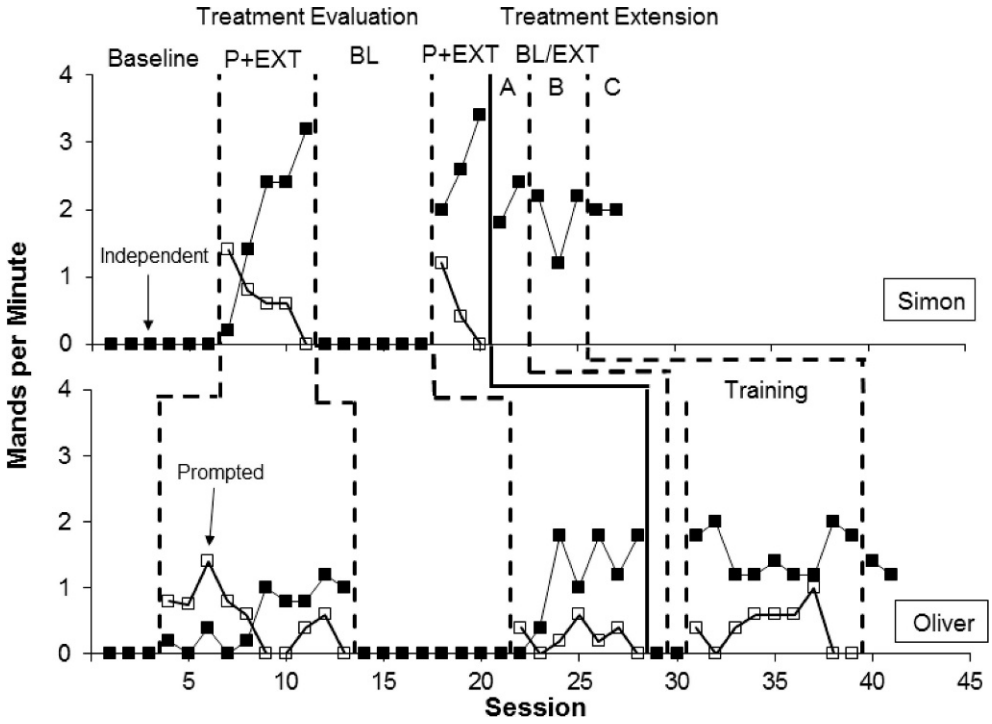

Figure 1. The number of mands per min during Simon's (top panel) and Oliver's (bottom panel) treatment evaluation (first four panels of figure) and treatment extension (last three or four panels of the figure). A = traveling 3.5 m to engage in peer-directed mands with the peer included in training; B = traveling 3.5 m to engage in peer-directed mands with a novel peer; C = traveling 7 m to engage in peer-directed mands with a novel peer in a more naturalistic setting.

directed mands during baseline. However, Simon and Oliver often engaged in adult-directed mands (M = 2.4 and 1.2, respectively; data not included in figure). Treatment produced an increase in independent mands with peers, although Oliver required more prompting from the therapist in the initial sessions of treatment than Simon. We did not collect data on adult-directed mands during treatment; however, anecdotal reports suggest that most prompted mands were preceded by an attempt to engage in an adult-directed mand. Independent mands with a peer rapidly decreased to zero during the reversal to baseline, and adult-directed mands increased (M = 3.2 and 1.9 for Simon and Oliver, respectively; data not included in figure). Oliver and Simon engaged in high levels of independent peer-directed mands when treatment was reintroduced.

During the treatment extension, Simon consistently engaged in peer-directed mands from a distance of 3.5 m with both Oliver (''A'' phase in the top panel of the figure) and Nigel (''B'' phase in the top panel of the figure). Simon also engaged in high rates of peer-directed mands during sessions in which he traveled 7 m to Nigel who played with Simon's highly preferred toys on the floor with his back turned toward Simon (''C'' phase in the top panel of the figure). Oliver did not display peer-directed mands with Simon (''A'' phase in the bottom panel of the figure) or Nigel (''B'' phase in the bottom panel of the figure) during the treatment extension baseline with extinction sessions. Thus, we implemented generalization training with Oliver and observed an immediate increase in peer-directed mands with a novel peer (Nigel) following training with Simon. Oliver's peer-directed mands maintained in subsequent baseline sessions during which he walked up to 7 m to Nigel who played with Oliver's highly preferred toys with his back toward Oliver during the session (last phase in bottom panel of the figure).

Our findings replicate and extend the literature on peer-directed mand training by teaching two non-vocal boys diagnosed with an ASD to engage in peer-directed mands with each other. In addition, the effects of our treatment procedure extended to a novel peer without additional training for one participant (Simon) and following training for another participant (Oliver). Both participants displayed high rates of peer-directed mands in the final treatment extension sessions during which a novel peer engaged in play with his back toward the participants and the adult was at least 7 m away from the children. Thus, both participants engaged in peer-directed mands in a context that closely matches a free-play activity in a typical classroom setting.

Despite participants displaying peer-directed mands in the last phase of the evaluation, the participants rarely engaged in peer-directed mands in the reversal to baseline during the treatment evaluation. One potential explanation for this finding is that the adult-directed mands continued to precede a proportion of peer-directed mands during treatment (based on anecdotal observations). As such, reinforcement for adult-directed mands in baseline may have decreased the likelihood of subsequent peer-directed mands. However, we did not consider adult-directed mands to be problematic. Attempts to engage in adult-directed mands prior to peer-directed mands could be considered the more appropriate stimulus conditions to maintain mands in the natural environment. For example, children may frequently engage in adult-directed mands for items their peers are consuming prior to engaging in peer-directed mands. This sequence of behavior may increase the likelihood of peer-directed mands producing appropriate consequences in the natural environment, because adults subsequently observe peer-directed mands and provide assistance if necessary. It may be even more important to obtain an adult's attention before engaging in a peer-directed mand with PECS, because a peer may be unable to correctly identify and/or deliver the appropriate consequence associated with the PECS card. In the absence of adult supervision, peer-directed mands may extinguish because of a reduced likelihood of reinforcement. Although we did not design our intervention to teach children to obtain adult attention prior to engaging in peer-directed mands, future research could more systematically evaluate the effects of this behavior chain on the maintenance of peer-directed mands with individuals with ASDs in natural settings.

Although our findings extend the current literature on peer-directed mands, this study included several limitations. First, the therapist did not collect data regarding the amount of assistance required to ensure the peer's delivery of the appropriate consequence following a peer-directed mand. Anecdotally, Nigel (the novel peer included in the treatment extension) did not require assistance from the therapist to accept the PECS card or deliver reinforcement, and Simon rarely required assistance. However, future studies could collect data regarding the peer's integrity in responding to peer-directed mands in the absence of adult assistance. In addition, peer training could be conducted prior to initiating peer-directed mand training to ensure that participants will readily accept and deliver appropriate consequences following a mand. Second, we did not include baseline sessions with extinction for adult-directed mands prior to the treatment evaluation. Although it is improbable that peer-directed mands would occur in the absence of direct training (Taylor et al., 2005), we cannot rule out this possibility. Future research should separate the effects of extinction and prompting on peer-directed mands by placing adult-directed mands on extinction in baseline. Third, we did not collect baseline data on peer-directed mands with a novel peer prior to training. The participants may have been more likely to engage in peer-directed mands with certain peers, although this appears unlikely because neither participant engaged in peer-directed mands in baseline or had a history of interacting with Nigel or each other prior to the study. Fourth, it remains unclear whether peer-directed mands were truly under the control of a relevant MO or controlled by the presence of the visual stimuli in the PECS binder. Because we restricted access to all items included in the PECS binder for at least 5 min prior to first session of the day, and the participants frequently selected different items within the binder during trials, it appears more likely that mands were under the control of an MO. However, future

research may seek to contrive MOs prior to conducting mand training by restricting access to preferred items for lengthier periods of time prior to each session. Finally, we did not conduct the treatment extension in novel settings. Additional research could extend our findings by evaluating the generalization of peer-directed mands in additional settings with several novel peers.

REFERENCES

Bondy, A., & Frost, L. (2001). The picture exchange communication system. *Behavior Modification*, *25*, 725–744.

Chaabane, D. B. B., Alber-Morgan, S. R., & DeBar, R. M. (2009). The effects of parent-implemented PECS training on improvisation of mands by children with autism. *Journal of Applied Behavior Analysis*, *42*, 671–677.

Fisher, W., Piazza, C. C., Bowman, L. G., Hagopian, L. P., Owens, J. C., & Slevin, I. (1992). A comparison of two approaches for identifying reinforcers for persons with severe and profound disabilities. *Journal of Applied Behavior Analysis*, *25*, 491–498.

Higbee, T. S., Carr, J. E., & Harrison, C. D. (2000). Further evaluation of the multiple-stimulus preference assessment. *Research in Developmental Disabilities*, *21*, 61–73.

Paden, A. R., Kodak, T., Fisher, W. W., Gawley-Bullington, E. M., & Bouxsein, K. J. (in press). Teaching children with autism to engage in peer-directed mands using a picture exchange communication system. *Journal of Applied Behavior Analysis*.

Sundberg, C. T., & Sundberg, M. L. (1990). Comparing topography-based verbal behavior with stimulus selection-based verbal behavior. *The Analysis of Verbal Behavior*, *8*, 31–41.

Taylor, B.A., Hoch, H., Potter, B., Rodriguez, A., Spinnato, D., & Kalaigian, M. (2005). Manipulating establishing operations to promote initiations toward peers in children with autism. *Research in Developmental Disabilities*, *26*, 385–392.